Claims

1. Method for the production of Al_2O_3/SiC nanocomposite abrasive grains,

characterized by the fact that an aluminum-oxide containing sol is mixed with SiC nanoparticles and subsequently gelled, dried, calcined and sintered.

2. Method according to Claim 1,

characterized by the fact that the aluminum-oxide containing sol contains as a solid component superfinely dispersed aluminum oxide monohydrate of the Boehmite type, aluminum alkoxides, aluminum halogenides and/or aluminum nitrate.

3. Method according to either Claim 1 or Claim 2,

characterized by the fact that that the addition of the SiC nanoparticles is done in an amount of between 0.1 and < 5 mol %, preferably in the range of 0.3 and 2.5 mol % relative to the aluminum contents of the mixture, calculated as Al_2O_3.

4. Method according to one or several of Claims 1 through 3,

characterized by the fact that prior to the gelling, sintering additives in the form of crystallization seeds, crystal growth inhibitors and/or other modifying components that influence the sintering process are added.

5. Method according to Claim 4,

characterized by the fact that fine-particled α aluminum oxide is used as crystallization seed.

6. Method according to one or several of Claims 1 through 5,

characterized by the fact that the gelling of the suspensions occurs by increasing or decreasing the pH value; through aging; the addition of electrolytes; increased temperature; and/or concentrating the solution.

7. Method according to one or several of Claims 1 through 6,

characterized by the fact that drying of the gel is carried out in a temperature range between 50 °C and 120 °C, with subsequent calcination between 500 °C and 800 °C, and sintering in a temperature range between 1300 °C and 1600 °C.

8. Method according to Claim 7,

characterized by the fact that sintering is done in a temperature range between 1380 °C and 1500 °C.

9. Method according to [Claim] 7,

characterized by the fact that sintering is carried out under inert conditions.

10. Method according to one or several of Claims 1 through 9,

characterized by the fact that comminution to the desired grain size is done before or after sintering.

11. Al_2O_3/SiC nanocomposite abrasive grain with a hardness of > 16 GPa, a density of > 95% of the theory, and an SiC portion of between 0.1 and < 5 mol %, relative to the Al_2O_3 matrix,

characterized by the fact that the SiC particles are present in the Al_2O_3 matrix as well as intragranularly and the abrasive grain shows a performance factor LF_{25} > 75 % in the single-grain scratch test.

12. Al_2O_3/SiC nanocomposite abrasive grain according to Claim 11,

characterized by the fact that the SiC portion preferably amounts to between 0.3 and < 2.5 mol %, relative to the Al_2O_3 matrix.

13. Al_2O_3/SiC nanocomposite abrasive grain according to one of Claims 11 or 12,

characterized by the fact that the SiC particles are predominantly present intragranularly in the Al_2O_3 matrix.

14. Al_2O_3/SiC nanocomposite abrasive grain according to one or several of Claims 11 through 13,

characterized by the fact that the Al_2O_3 crystals of the matrix show mean diameters of between 0.2 μm and 20 μm.

15. Al_2O_3/SiC nanocomposite abrasive grain according to one or several of Claims 11 through 13,

characterized by the fact that the Al_2O_3 matrix has a submicron structure and a mean particle size of < 1 μm, preferably < 0.5 μm.

16. Al_2O_3/SiC nanocomposite abrasive grain according to Claim 15,

characterized by the fact that coarse Al_2O_3 crystals are formed in the submicron Al_2O_3 matrix.

17. Al_2O_3/SiC nanocomposite abrasive grain according to Claim 16,

characterized by the fact that the coarse Al_2O_3 crystals have a mean diameter of > 2 μm, preferably > 5 μm.

18. Al_2O_3/SiC nanocomposite abrasive grain according one of Claims 16 or 17,

characterized by the fact that the coarse Al_2O_3 crystals have an oblong shape.

19. Al_2O_3/SiC nanocomposite abrasive grain according to one or several of Claims 16 through 18,

characterized by the fact that the coarse Al_2O_3 crystals have a length/width ratio of between 2:1 and 10:1, preferably between 4:1 and 6:1.

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20. Utilization of Al_2O_3/SiC nanocomposite abrasive grains according to one or several of Claims 11 – 19 for the production of grinding belts and grinding disks.